

REMARKS

Claims 1-26 were pending in this application prior to the office action. By this amendment, claim 26 is amended. Thus, claims 1-26 remain pending. In addition, the paragraph beginning on page 4, line 12, of the Specification has been amended. No new matter has been added by this amendment. In view of the above amendments and the following remarks, Applicants respectfully request reconsideration and allowance of the application.

Claim 26 stands objected to as being of improper dependent form for failing to further limit the subject matter of a previous claim. However, claim 26 is amended herein to recite its dependency on claim 23 rather than claim 13. Thus, claim 26 is in proper dependent form, and this objection should be withdrawn.

Claims 1-26 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art (APA) in view of Ohnishi (Pub. # 20040050176). In particular, the Examiner asserts that the only inventive feature in the instant invention is the use of the shock-wave (Oscillation Wave) generating piezoelectric element, that Ohnishi teaches the use of oscillation wave generating and receiving piezoelectric devices in the same arrangements as the APA positions the ultrasonic piezoelectric transducers, and that it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use the oscillation wave generating and receiving piezoelectric elements for the known ultrasonic wave generating and receiving piezoelectric elements since such are mere alternatives that would function equally in the environment of measuring flow in a conduit without being in direct contact with the fluid.

However, neither Ohnishi nor the admitted prior art, taken alone or in combination, disclose, suggest, or render obvious the claimed invention. Specifically, it appears that the Examiner is incorrectly asserting that the shock-wave of the invention is identical to an oscillation wave. This is not the case.

Applicants respectfully direct the Examiner's attention to the definitions of "oscillation" and "shock wave" according to the McGraw-Hill "DICTIONARY OF SCIENTIFIC AND

TECHNICAL TERMS, Third Edition.” “Oscillation” is defined as “any effect that varies periodically back and forth between two values.” In contrast, “shock wave” is defined as “a fully developed compression wave of large amplitude, across which density, pressure, and particle velocity changes drastically.” These two terms are clearly distinct from one another, and there is no specific relationship between a shock wave and an oscillation wave.

The use of shock waves in the present invention results in surprising effects. For example, as is described in the Specification on page 4, lines 12-25, the present inventors have made studies on a relationship between an electric energy applied to one piezoelectric ultrasonic transducer of the conventional flow meter and a wave form of a ultrasonic wave received by another piezoelectric ultrasonic transducer which is transmitted through a flowing fluid after generation in the former ultrasonic transducer. As a result, they have discovered that if the sine wave alternating energy employed in the conventional system for applying the energy to the piezoelectric element is replaced with a shock energy caused by application of an impulse voltage having steep rising edge or steep falling edge, a shock wave received by a wave-receiving piezoelectric element after generation and transmission in a flowing fluid gives a simpler wave form and hence the determination of the target point for the measurement of transmission period is facilitated. This phenomenon has not been known until now.

Furthermore, page 5, lines 1-14, of the Specification provides that, as a result of further study, the inventors have discovered that if the impulse voltage with steep rising edge or steep falling edge is employed as the energy to be applied to the shock wave-generating piezoelectric element, the generated shock wave received after transmission from the upstream side to the downstream side and the generated shock wave received after transmission from the downstream side to the upstream side show the same wave form, and an amplitude and a integral value of a composite wave prepared by processing (such as addition processing or subtraction processing) of the wave form of the received shock wave shows a highly proportional relationship with a flow rate of the flowing fluid. This phenomenon also has not been known yet.

In contrast, the Examiner asserts that Ohnishi discloses the use of oscillation wave generating and receiving piezoelectric devices in the same arrangements as the APA positions the ultrasonic piezoelectric transducers, and thus equates those with the shock waves of the claimed invention. However, Ohnishi merely discloses the use of conventional oscillation waves, which, as is explained above, are not the same as shock waves, such as those recited in the claims.

Furthermore, in the Ohnishi system, a period of transmission of an oscillation wave transmitted in the wall of tube is measured for determining the flow rate of the flowing fluid. This is not the same as the measurement system recited in the claims, which is based on the transmission of a shock wave through the moving fluid. Therefore, in addition to the above distinctions, there is a clear difference between the flow rate determination system of the claimed invention and the Ohnishi's flow rate determination system.

Accordingly, for at least the above reasons, neither Ohnishi nor the admitted prior art, taken alone or in combination, disclose, suggest, or render obvious the claimed invention as recited in claims 1-26. Therefore, the rejection of claims 1-26 under 35 U.S.C. § 103(a) in view of the admitted prior art and Ohnishi should be reconsidered and withdrawn.

In view of the foregoing, it is submitted that the present application is in condition for allowance and a notice to that effect is respectfully requested. If, however, the Examiner deems that any issue remains after considering this response, the Examiner is invited to contact the undersigned attorney to expedite the prosecution and engage in a joint effort to work out a mutually satisfactory solution. In addition, should the Examiner deem it necessary to issue a further rejection in connection with this application, Applicants respectfully request that the Examiner provide an indication of the specific portions of any reference relied upon in making the rejections.

Except for issue fees payable under 37 C.F.R. § 1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required,

including any required extension of time fees, or credit any overpayment to Deposit Account No. 19-2380. This paragraph is intended to be a **CONSTRUCTIVE PETITION FOR EXTENSION OF TIME** in accordance with 37 C.F.R. § 1.136(a)(3).

Respectfully submitted,

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